New York City Research Initiative

Expandable Deployed Lunar Base for the Purpose of the Establishment of a Lunar Colony

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Main Objectives

Design a Lunar Colony that will be cost-effective, durable, and expandable. It will provide the foundation for a permanent Lunar Colony.

Benefits

The Moon's thin atmosphere allows for pristine conditions for research and projects that would be contaminated by Earth's atmosphere. Certain minerals, such as natural titanium and silicon, are rare on earth but common on the Moon, making them within easy reach for mining. Finally, the Moon can be a jump-off point for the rest of the solar system.

Background Information

Geography: Radioactive equator, poles with constant sunlight and frozen resources

Soil: Mostly basalt type rocks, composed of Iron, Silicon, Titanium, Oxygen, Helium

Atmosphere: Very thin layer of 90% Nitrogen, Trace Helium, Hydrogen

Temperature Range: -150° to 100° C at equator, - 50° to 50° C at poles

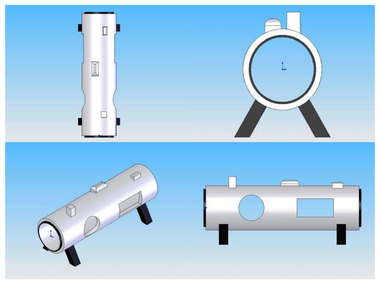
Colony Structure

The size of this Stationary design will be two 35' sections for living quarters, and one 15 foot section for observations.

The stationary design will cost a lot, but it will last a long time

Materials:

- Iridium – 30%
- Titanium – 20%
- Inconel 625 – 20%
- Stainless Steel – 15%
- Tungsten – 10%
- Demron – 5%



Site Chosen

Criteria	%	N - Pole	N - Pole Weighted	S - Pole	S - Pole Weighted	Equator Near Side	Near Side Weighted	Equator Far Side	Far Side Weighted
Areas of Constant Light	20	5	100	2	40	2	40	1	20
Radiation Exposure	20	3	60	3	60	4	80	1	20
Resource Availability	15	3	45	5	75	2	30	2	30
Radio Contact	15	4	60	4	60	5	75	1	15
Ease of Transport	15	4	60	4	60	3	45	1	15
Placement of Installation	15	3	45	3	45	4	60	3	45
Total	100	22	370	21	340	20	330	9	145

Material Evaluation

Criteria	%	Titanium Score	Titanium Wght'd Score	Tungsten Score	Tungsten Wght'd Score	Tungsten Carbide Score	Tungsten Carbide Wght'd Score	Inconel 625 Score	Inconel 625 Wght'd Score	Demron Score	Demron Wght'd Score	Stainless Steel Score	Stainless Steel Wght'd Score
Material Weight	20	9	180	7	140	7	140	6	120	10	200	8	160
Reliability	20	9	180	9	180	9	180	7	140	10	200	9	180
Cost	20	5	100	8	160	9	180	8	160	7	140	7	140
Melting Point	20	9	180	10	200	9	180	8	160	5	100	8	160
Insulation	20	8	160	9	180	9	180	9	180	10	200	9	180
Total	100	40	800	43	860	43	860	39	760	42	840	41	820

Energy

Solar Power with Plexiglas covering to protect from radiation

Nuclear Fusion Reactor using Helium present in Lunar Soil

Rechargeable battery system to power station during nights, recharged during day

Energy Comparison

Criteria		Solar	Solar Weighted	Fusion	Fusion Weighted	Battery	Battery Weighted
Availability of Fuel	20	3	60	5	100	2	40
Expected Cost and Benefits	20	5	200	4	80	3	60
Radiation Exposure	20	5	100	3	60	5	100
Size	15	4	60	4	60	2	30
Weight	15	3	45	2	30	3	45
Ease of Transport	10	3	30	4	40	2	20
Total	100	23	390	22	375	17	295

Transportation

A moon rover or other vehicle would be used to travel. There would either be an External design or an Internal design. A landing craft would be used to bring initial supplies

External Design

Internal Design w / Pressurized Cabin

Supplies

Food
- MRE's
- Natural Produce

Air
- Air Recycler / Tanks
- Plant-Generated

Water
- Recycled
- Generated on site

First Aid

Equipment
- Mining Tools
- Telescopes
- Computers
- Suits

Fuel
- Hydrocarbon Fuel

Material Cost

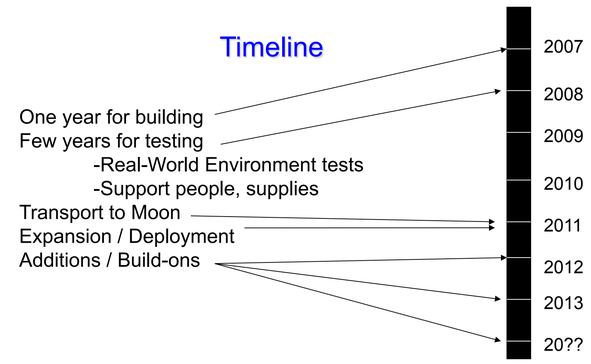
Material	%	Weight (lbs)	Cost	Price/lb
Iridium	30%	600	$300,000	$500
Titanium	20%	400	$40,000	$100
Inconel 625	15%	300	$6000	$20
Stainless Steel	15%	300	$2000	$7
Tungsten	10%	200	$10,000	$50
Demron	5%	100	$60000	$600
Fiberglass Insulator	5%	100	$800	$8

Computers	$50,000
Food	$15,000
Telescope	$295,000
Mining Tools	$10,000
First Aid	$10,000
Air Recycler	$2,000
Vehicle	$68,500

Total: $855,800*

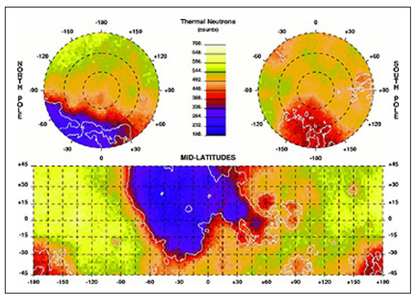
*Not including fuel/transportation fees ($20 million) and assembly fees ($25-30 million)

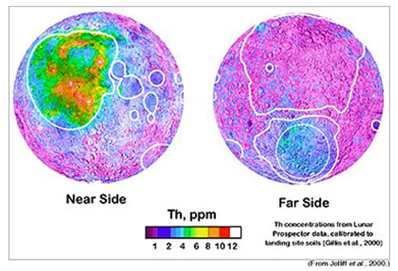
Timeline



Human Considerations

Humans can stay on the Moon with the proper equipment, but cannot stay for a long time until plenty of observations are taken. Bone loss of 39% over long periods can occur. Lung Cancer and Cardiovascular problems can occur from the ever-present and intrusive lunar dust. Precautions to avoid contact with radiation must also be taken.





Conclusion

A Lunar base can be established within the given time frame specified above.

Supply trips
- One month apart
- Bring an additional section each trip
- Slow down as colony becomes self-sufficient

Sponsors:
National Aeronautics and Space Administration (NASA)
NASA Goddard Space Flight Center (GSFC)
NASA Goddard Institute for Space Studies (GISS)
NASA New York City Research Initiative (NYCRI)

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